Six month progress report
NA16OC2938 – WAVCIS
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Goal: Enhancement of Wave Modeling

Achievements

- The SWAN (Simulating Waves Nearshore) model has been made operational on a real-time basis for coastal Louisiana. The model is forced with real-time winds as well real-time boundary information from the shallow water WAVCIS stations. The spatial information of wave parameters from SWAN covers a geographic domain of 16 Km (along east-west direction) and 7.2 Km (along the north-south direction) at a uniform grid spacing of 1 Km X 1 Km. Model computed parameters from SWAN which includes mean wave height, direction and period are updated periodically every one hour to the WAVCIS website. Visualization based tools are being developed to skill assess SWAN with real-time in-situ observations.

- Deep water wave model (WAM) has been adapted for the Gulf of Mexico at a horizontal resolution of 0.25º X 0.25º. Test case of WAM forced with extreme event winds (derived from storm model) has been initially carried out as a pilot study. Recently, the test run of WAM for the extreme event Hurricane Ivan using NCEP analyzed/forecasted wind fields has also been attempted. Preliminary, skill assessment of NCEP wind fields with the deep water NDBC buoys revealed reasonably good match between model and observations. For the location east of the track, the NCEP wind fields were found to be under-estimated.

- STWAVE (Steady State Wave Model) has also been successfully implemented for coastal Louisiana. The model has been simulated for a period of 24 hours with real-time winds from WAVCIS stations during the period of Hurricane Charley when the wave heights recorded from WAVCIS stations reached a peak value of 1.26 meters. The model simulations especially within the vicinity of Barrier Islands performed better compared to the SWAN simulations for the same period.

Ongoing Activities:

- The study aims to develop an operational real-time/forecast system for the entire Gulf of Mexico integrating deep water WAM model with shallow water models like SWAN, STWAVE and REF/DIF. The wind field for forcing the deep water WAM will be through atmospheric models like MM5, COAMPS and WRF (collaborated through Jackson University), and also analyzed/forecasted wind fields from NCEP. To accomplish this objective the Gulf of Mexico will be divided into three study zones, viz; Zone-1, Zone-2 & 3. The geographic domain

of Zone-1 covers the entire Gulf of Mexico where WAM model is proposed to be run daily on operational mode using wind forcing from NOGAPS/COAMPS. The special output locations of WAM will be similar to the locations of the deep water NDBC bouys. Multiple nestings of WAM can also be perfomed at selected sites for a detailed study.

- Zone-2 and Zone-3 will serve as the sub-sets of Zone-1. The grid corresponding to Zone-2 will cover intermediate water depths for simulating SWAN. Multiple nestings will be performed in Zone-2 which serves as boundary inputs to Zone-3. The coarse grid boundary information from Zone-1 will be provided as forcing term to Zone-2. As most of the grid points in Zone-2 are wet-grid points, boundary forcing through Zone-1 will look more realistic in treating the boundary coordinates as well improve the efficiency of model computation in dealing wave propagation from coarse grid to a finer resolution grid. The finest grid in Zone-3 along with computed boundary information of Zone-2 will be used to force the multiple-nested SWAN for five identified areas, viz; (i) Cameron Bay, (ii) Atchafalaya Bay, (iii) Terrebonne Bay, (iv) Barataria Bay and (v) Vermilion Bay. As the topographic features in Zone-3 are highly complex compared to Zone-1 and 2, STWAVE computations will be made parallel with SWAN to study wave propagation through inlets and barrier islands. To study the wave diffraction and reflection patterns at very near shore areas, REF/DIF model will be used using the directional spectral information from SWAN.

- Development of skill assessment tool between model computation and in-situ observation is on the way. The robustness and versatility of model can be assessed through specific events like hurricanes and cold fronts. Model computed directional spectra will also be collated with the directional spectra from the NDBC buoys and WAVCIS observational arrays.

WAVCIS Stations

- In the past half-year, WAVCIS stations were properly maintained. Major sensors have been properly functioning since deployment.
- All ECM current sensors wre replaced with either Sontek ADV or Nortek Aquadopp which have more reliable and accurate current measurement.
- Additional sensors have been deployed. A 600 KHZ RDInstrument ADCP, three 6000 Series YSI, and a series of conductivity sensors, sea temperature sensors have been deployed at CSI 06.
- CSI 14 at Cote Blanche Bay was deployed.
- On-site computer has been upgraded to Pentium 4 cappuccino slim pro computer.

WAVCIS presentation

- Data were archived in a SQL server database.
- All measured information are automatically presented on the web page at www.wavcis.lsu.edu

- ADCP directional spectral information and spectral evolution were available online.
- Customized online query system in both graphic and ASCII format have been improved for easy accessing WAVCIS database.
- The protocol of an operational wave simulation system for the Gulf of Mexico and offshore Louisiana coast has been successfully tested and will be online soon. WAM and SWAN are primarily used wave models.
- Hard copies of measured information for each station have been printed monthly.

Web GIS development

- Map server has been successfully upgraded to ArcIMS 9.0.
- Successfully developed and tested automatic conversion from model results to GIS compliant format for serving online web GIS.
- Customized online web GIS interface has been developing for displaying both model results and ocean observing results.

All goals and objectives were met for the period under review.

No cost overruns were incurred.